# The Center for Nanoscale Materials At Argonne National Laboratory

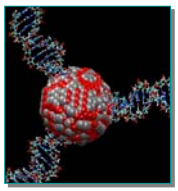
***The Center for Nanoscale Materials is a Department of Energy Nanoscale Science Research Center and User Facility for the fabrication and exploration of advanced nanomaterials. It will enable all stages of research and development on nanoscale materials, from synthesis and patterning through metrology, chemical and structural determination, properties characterization, and theory. The Center's location at Argonne takes advantage of the hard x-ray Advanced Photon Source (APS), the Intense Pulsed Neutron Source, and the Electron Microscopy Center. The Office of Basic Energy Sciences will fund the Center's equipment and operations. The CNM will be located adjacent to the APS in a building funded by the State of Illinois. The CNM is building a hard x-ray nanoprobe beamline at the APS to focus down to an unprecedented resolution of 30 nanometers.***

## Nanoscience to Address the Grand Challenges

Providing the Nation with a state-of-the-art User Facility for the development and dissemination of the science and techniques required for the design, synthesis, characterization and theory of materials at the nanoscale…

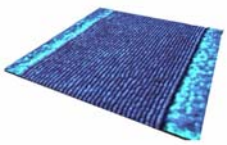
… Bridging materials, chemical, biological and computational sciences and advanced characterization tools.

## CNM Scientific Groups

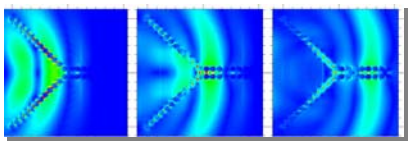


New functional nanocomposites

- BioNano Composites
- Electronic and Magnetic Materials and Devices
- Nanophotonics
- Theory and Simulation
- Nanopatterning
- X-Ray Imaging & Scattering



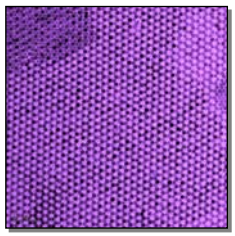
Assembly of functionalized arrays



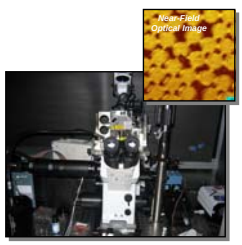
New properties and novel devices

## CNM Equipment

- Nanosynthesis
  - Self-assembly
  - Bio/organic/inorganic synthesis
  - Thin film synthesis
    - Carbon CVD
    - Oxide MBE
- Nanopatterning
  - High-voltage electron beam lithography
  - Focused ion beam patterning
  - Nanoimprint lithography
- Characterization
  - Scanning probes
  - Confocal fluorescence optical microscopy
  - Ultrafast pump-probe near-field scanning optical microscopy
  - Hard x-ray nanoprobe
- Theory and Simulation
  - Leveraging ANL leadership computing



Multilayer of cobalt nanocrystals




CNM's near-field scanning optical microscope

## Facilities and Expertise for Partnership

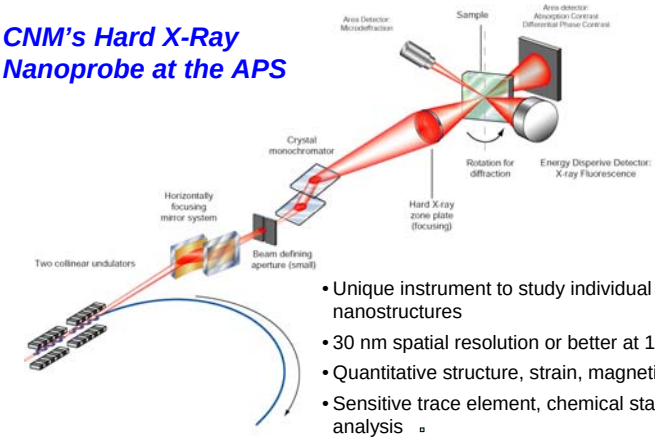
- 85,000 sq. ft. building to be completed April 2006
- Scientific and user programs to be fully running by Fall 2007


## CNM User Program

- Open access for all users
  - –Best science via peer-reviewed proposals
- Two phases
  - – Early Access
    - •Provide users access to existing ANL nanoscience capabilities
  - – New Facilities
    - •New equipment, beginning Summer 2006, and Nanoprobe beamline, beginning Fall 2007

CNM Proposals Received


## *CNM's Hard X-Ray Nanoprobe at the APS*




- Unique instrument to study individual nanostructures
- 30 nm spatial resolution or better at 10keV
- Quantitative structure, strain, magnetization
- Sensitive trace element, chemical state analysis
- Ability to penetrate overlayers, environments, fields

For additional information, visit
http://nano.anl.gov

ARGONNE NATIONAL LABORATORY

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THE UNIVERSITY OF CHICAGO

Office of Science U.S. DEPARTMENT OF ENERGY